

Application No.: 10/618,085
Amendment Dated: August 25, 2003

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

Claims 1-32. (Canceled)

Claim 33 (New): A method for forming a conic body, comprising:
performing high selectivity anisotropic etching of a substrate or predetermined layer
by using as a micro mask an impurity precipitation defect caused by a first impurity included
in the substrate or predetermined layer; and
allowing a conic body to be exposed from a surface of the substrate or layer, the conic
body being formed with the impurity precipitation defect located at its top.

Claim 34 (New): A method as defined in Claim 33, wherein
the substrate or the predetermined layer is a semiconductor material substrate or a
semiconductor material layer.

Claim 35 (New): A method as defined in Claim 34, wherein
the impurity precipitation defect has an etching rate different from that of a main
component material of the semiconductor material substrate or layer; and
the impurity precipitation defect is a defect formed by precipitation of the first
impurity included in the semiconductor material substrate or layer into a crystal of the
semiconductor material substrate or layer as a result of a thermal treatment performed during
or after manufacturing of the semiconductor material substrate or layer.

Claim 36 (New): A method as defined in Claim 34, wherein
the semiconductor material substrate or layer comprises silicon; and

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the first impurity is oxygen.

Claim 37 (New): A method as defined in Claim 34, wherein
the semiconductor material substrate or layer further comprises a second impurity
which more readily bonds to said first impurity than to a material of the semiconductor
material substrate or layer.

Claim 38 (New): A method as defined in Claim 37, wherein
the semiconductor material substrate or layer comprises silicon;
the first impurity is oxygen; and
the second impurity is boron.

Claim 39 (New): A method as defined in Claim 34, wherein
the conic body is formed in an etching exposure surface of the semiconductor material
substrate or layer so as to have a height in accordance with a distance from a location of the
impurity precipitation defect to the etching exposure surface.

Claim 40 (New): A method as defined in Claim 34, wherein
when a plurality of impurity precipitation defects are present, the high selectivity
anisotropic etching is performed to form, in an etching exposure surface of the semiconductor
material substrate or layer, the conic bodies having substantially similar shapes each having
the impurity precipitation defect located at its top and having a height in accordance with a
distance from a location of the impurity precipitation defect to the etching exposure surface.

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Claim 41 (New): A method as defined in Claim 40, wherein
the conic body formed in the etching exposure surface has a top end size in
accordance with a size of the impurity precipitation defect, and an aspect ratio of about 10 or
more.

Claim 42 (New): A method for forming a truncated conic body, comprising:
performing high selectivity anisotropic etching of a substrate or predetermined layer
by using as a micro mask an impurity precipitation defect caused by a first impurity included
in the substrate or predetermined layer; and
allowing a truncated conic body to be exposed from a surface of the substrate or layer,
the truncated conic body being formed with the impurity precipitation defect located at its
top.

Claim 43 (New): A method as defined in Claim 42, wherein
the substrate or the predetermined layer is a semiconductor material substrate or a
semiconductor material layer.

Claim 44 (New): A method as defined in Claim 43, wherein
the impurity precipitation defect has an etching rate different from that of a main
component material of the semiconductor material substrate or layer; and
the impurity precipitation defect is a defect formed by precipitation of the fast
impurity included in the semiconductor material substrate or layer into a crystal of the
semiconductor material substrate or layer as a result of a thermal treatment performed during
or after manufacturing of the semiconductor material substrate or layer.

Claim 45 (New): A method as defined in Claim 43, wherein
the semiconductor material substrate or layer comprises silicon; and
the first impurity is oxygen.

Claim 46 (New): A method as defined in Claim 43, wherein
the semiconductor material substrate or layer further comprises a second impurity
which more readily bonds to said first impurity than to a material of the semiconductor
material substrate or layer.

Claim 47 (New): A method as defined in Claim 46, wherein
the semiconductor material substrate or layer comprises silicon;
the first impurity is oxygen; and
the second impurity is boron.

Claim 48 (New): A method as defined in Claim 43, wherein
the truncated conic body is formed in an etching exposure surface of the
semiconductor material substrate or layer so as to have a height in accordance with a distance
from a location of the impurity precipitation defect to the etching exposure surface.

Claim 49 (New): A method as defined in Claim 43, wherein
when a plurality of impurity precipitation defects are present, the high selectivity
anisotropic etching is performed to form, in an etching exposure surface of the semiconductor
material substrate or layer, the truncated conic bodies having substantially similar shapes each

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having the impurity precipitation defect located at its top and having a height in accordance with a distance from a location of the impurity precipitation defect to the etching exposure surface.

Claim 50 (New): A method as defined in Claim 43, wherein after forming the truncated conic body in the substrate or predetermined layer by using as a micro mask the impurity precipitation defect, the high selectivity anisotropic etching is continued to remove the impurity precipitation defect and to etch a top end of the truncated conic body in a shape of a mortar from the top toward the bottom of the truncated conic body, thereby forming an annular shape at the top end.

Claim 51 (New): A method as defined in Claim 50, wherein the truncated conic body formed in the etching exposure surface has a top end diameter in accordance with a size of the impurity precipitation defect, and an aspect ratio of about 10 or more; and the top annular portion has a thickness of 1nm to 2nm.

Claim 52 (New): A method as defined in Claim 50, wherein the mortar shape formed at the top end of the truncated conic body is substantially similar to the shape of the truncated conic body.